CLAIMS

The embodiment of the invention in which an exclusive property or privilege is claimed is defined as follows:

1. A process for removing elemental mercury from a gaseous stream comprising:

a) contacting a vaporized oxidizing agent with the gaseous stream for a time and at a temperature sufficient to form water soluble nitrogen and mercury-containing compounds; and

b) removing the water soluble compounds from the gas stream.

2. The method as recited in claim 1 wherein the oxidizing agent comprises chloric acid and an alkali metal chlorate.

3. The method as recited in claim 1 wherein the principal components in the gaseous stream are vaporized chemicals selected from the group consisting of mercury, nitrogen oxides, sulfur oxides, carbon oxides, hydrochloric acid, oxygen, nitrogen, water vapor, and combinations thereof.

4. The method as recited in claim 1 wherein the oxidizing agent is present in an aqueous solution at a concentration of from 0.01 to 5 weight percent.

5. The method as recited in claim 1 wherein the temperature is maintained above room temperature.

6. The method as recited in claim 1 wherein the oxidizing agent is an alkaline compound selected from the group consisting of an alkali metal hydroxide, an alkaline earth metal hydroxide, an alkali metal carbonate, an alkaline earth metal carbonate, and mixtures thereof.

7. A method for simultaneosly removing elemental mercury and NO_x from a flue gas stream containing other constituents, the method comprising:

a) vaporizing an aqueous solution containing an oxidizing agent; and

b) contacting the vaporized oxidizing agent with the gaseous stream for a time and at a temperature sufficient to form water-soluble nitrogen- and mercury-containing compounds; and

c) removing the water-soluble compounds.

8. The method as recited in claim 7 wherein the oxidizing agent comprises chloric acid and an alkali metal chlorate.

9. The method as recited in claim 7 wherein the components in the gaseous stream are selected from the group consisting of mercury, nitrogen oxides, sulfur oxides, carbon oxides, hydrochloric acid, oxygen, nitrogen, water vapor, and combinations thereof.

10. The method as recited in claim 7 wherein the oxidizing agent is present at a concentration of from 0.01 to 5 weight percent of the aqueous solution.

11. The method recited in claim 7 wherein the presence of NO_x improves removal of Hg^0.

12. The method as recited in claim 7 wherein the temperature is maintained above room temperature.

13. The method recited in claim 7 wherein the aqueous solution consists of an alkaline compound selected from the group consisting of: an alkali metal hydroxide, an alkaline earth metal hydroxide, an alkali metal carbonate, an alkaline earth metal carbonate, and mixtures thereof.

14. A method to simultaneously remove mercury and nitric oxide from flue gas, the method comprising:

a) vaporizing an oxidizing agent;

b) contacting the vaporized oxidizing agent with the flue gas for a time and at a temperature sufficient to create soluble fractions of the mercury and nitric oxide; and

c) isolating the fractions from the flue gas.

15. The method as recited in claim 14 wherein the oxidizing agent contains halogen compounds selected from the group consisting of chloric acid, chlorine dioxide, molecular chlorine, sodium chlorate, sodium chlorite, sodium hypochlorite, bromic acid, iodic acid, and combinations thereof.

16. The method as recited in claim 14 wherein the oxidizing agent is present with the Hg in the flue gas in a weight ratio of between approximately 100,000 : 1 to 1000: 1 of oxidizing agent : Hg.

17. The method as recited in claim 14 wherein the step of isolating the fractions further comprises contacting the flue gas with alkaline solution.

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18. The method as recited in claim 14 wherein the flue gas contains sulfur oxides at concentrations up to 4,000 ppm.

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19. The method as recited in claim 14 wherein the oxidizing agent is present with the flue gas in a weight ratio of between approximately 1:500,000 and 1:100 of oxidizing agent : flue gas.